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CLAIMS

1. A control apparatus of an internal combustion engine comprising:

5 a combustion control unit which controls combustion of the engine at a time of stopping the engine;

an inertia energy control unit which controls inertia energy of the engine to be in a predetermined state; and

10 a stop control unit which stops the engine at a predetermined crank angle position by utilizing the inertia energy.

2. The control apparatus of the internal combustion engine according to claim 1, wherein the inertia energy control unit controls a number of engine revolution of the engine to be within 15 a range of a predetermined number of engine revolution.

3. The control apparatus of the internal combustion engine according to claim 2, wherein the inertia energy control unit controls the inertia energy by a motor for driving the engine.

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4. The control apparatus of the internal combustion engine according to claim 3, wherein the combustion control unit starts the combustion of the engine while driving by the motor is continued, when a starting request occurs in the engine in a condition that 25 the number of engine revolution is controlled to be within the predetermined number of engine revolution by the motor.

5. The control apparatus of the internal combustion engine according to claim 1, wherein the stop control unit stops the 30 engine at the predetermined crank angle position by adding control force to the engine by the motor for driving the engine.

6. The control apparatus of the internal combustion engine according to claim 5, wherein the stop control unit adds the control force to the engine by the motor for driving the engine when the engine is not estimated to stop at the predetermined 5 crank angle position.

7. The control apparatus of the internal combustion engine according to claim 5, further comprising a detecting unit which detects a number of idling revolution of the engine, wherein 10 the stop control unit inhibits stopping the engine when the number of idling revolution is larger than a predetermined value.

8. The control apparatus of the internal combustion engine according to claim 5, further comprising a detecting unit which 15 detects the number of idling revolution, wherein the combustion control unit increases the combustion of the engine to increase the number of engine revolution before stopping the combustion of the engine when the number of idling revolution is smaller than the predetermined value.

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9. The control apparatus of the internal combustion engine according to claim 2, wherein the combustion control unit stops the combustion of the engine when the inertia energy control unit controls the number of engine revolution to be within the 25 predetermined number of engine revolution.

10. The control apparatus of the internal combustion engine according to claim 1, further comprising a unit for reducing loads of the engine when the stop control unit performs an engine 30 stop control.

11. The control apparatus of an internal combustion engine according to claim 1, further comprising:

a start control unit which drives the engine by the motor at a time of engine start;

an estimation unit which estimates a cylinder in a compression stroke and/or an expansion stroke at the time of
5 the engine stop;

a detection unit which detects the cylinder;

a supplying unit which supplies fuel to the cylinder; and
a combustion unit which combusts the fuel supplied to the cylinder at the time of the engine start.

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12. The control apparatus of the internal combustion engine according to claim 11, wherein the supplying unit supplies the fuel to the cylinder via an intake port, or directly supplies the fuel to the cylinder.

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13. The control apparatus of the internal combustion engine according to claim 11, wherein the predetermined crank angle position is a stop position at which a torque of the motor needed at the time of the engine start becomes small.

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14. The control apparatus of the internal combustion engine according to claim 11, wherein the engine stops at the predetermined crank angle position by the motor which controls a number of engine revolution to be within a predetermined number
25 of engine revolution.

15. The control apparatus of the internal combustion engine according to claim 11, wherein the supplying unit supplies the fuel to the cylinder when the cylinder which is detected based
30 on the detection unit immediately before the time of the engine stop is in the intake stroke.

16. The control apparatus of the internal combustion engine according to claim 11, wherein the start control unit starts the engine by driving the motor when a current value added to the motor is larger than a predetermined value at the time of 5 the engine start.

17. The control apparatus of the internal combustion engine according to claim 11, wherein the estimation unit estimates the cylinder which is in the compression stroke and/or the 10 expansion stroke, based on the number of engine revolution at a time of stopping driving by the motor.

18. The control apparatus of the internal combustion engine according to claim 11, wherein the estimation unit estimates 15 the cylinder which is in the compression stroke and/or the expansion stroke, based on the number of engine revolution at the time of stopping driving by the motor and a kind of the stroke of each cylinder at a time of starting driving by the motor.

20 19. The control apparatus of the internal combustion engine according to claim 18, wherein the estimation unit specifies the kind of the stroke of each cylinder, based on a cam position of the cylinder.